TRANSLATION

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
P802065/WO/1		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DE2004/002174	30.09.2004	17.10.2003

International Patent Classification (IPC) or national classification and IPC

F01D11/00,F01D11/02,F16J15/44

Applicant

MTU AERO ENGINES GMBH

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DE2004/002174

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-6 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. _____ as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* 1-8 received by this Authority on 06.08.2005 with letter of 02.08.2005

nos.* _____ received by this Authority on _____

☒ the drawings:

sheets 1/1 as originally filed/furnished

sheets* _____ received by this Authority on _____

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DE2004/002174

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims		NO
Inventive step (IS)	Claims	1-8	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

1. This report makes reference to the following documents:

D1: EP 1 347 152 A (GENERAL ELECTRIC COMPANY), 24 September 2003 (2003-09-24)

D2: US 4 351 532 A (LAVERTY ET AL), 28 September 1982 (1982-09-28)

2. Document D1 is considered to constitute the prior art closest to the subject matter of claim 1 and discloses (the references in parentheses are to that document; see figure 1):

a sealing arrangement for a gas turbine used to seal a gap between the radially inner ends of guide vanes (36) of a vane ring and a rotor, the rotor comprising at least two sealing projections which extend in the circumferential direction of the rotor and are spaced apart in the axial direction (the first and third projections designated by (54)), the sealing projections sealing the gap in combination with inlet backing layers (60) which form a honeycomb structure and

are associated with the radially inner ends of the guide vanes. The sealing projections are inclined or slanted in the axial direction towards a higher-pressure side (see (54) and the gas flow direction in the turbine), and at least one central **sealing projection** oriented towards the higher-pressure side is arranged in the space delimited by the at least two sealing projections (the first and third projections designated by (54)) and the corresponding inlet backing layers.

2.1 The subject matter of claim 1 thus differs from the known sealing arrangement for a gas turbine in that a recirculation structure is arranged instead of a sealing projection in the space delimited by the at least two sealing projections and the corresponding inlet backing layers.

2.2 The subject matter of claim 1 is thus novel (PCT Article 33(2)).

3. The present invention can therefore be considered to address the problem of optimising a sealing arrangement which comprises sealing projections and corresponding inlet backing layers designed as a honeycomb structure.

3.1 The solution to this problem, as proposed in claim 1 of the present application, involves an inventive step (PCT Article 33(3)) for the following reasons:

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The integration of a thus designed recirculation structure in the sealing arrangement comprising sealing projections and corresponding inlet backing layers further optimises the sealing effect.

3.2 Even if document D2 shows a sealing arrangement with a recirculation structure, a person skilled in the art would not combine the technical features of D2 with the technical features of D1. D2 actually deals with a contactless labyrinth with corresponding gaps (a sealing principle which differs from the sealing principle of the sealing arrangement in D1, in which the sealing projections are designed to brush against the backing). A person skilled in the art would consider the recirculation structure described in D2 an additional flow measure which would not be necessary or helpful in sealing arrangements having straight or slanted sealing projections and inlet backing layers designed as a honeycomb structure.

3.3 Claims 2-8 are dependent on claim 1 and thus also meet the PCT novelty and inventive step requirements.

4. The sealing arrangement according to the present application is industrially applicable in the field of turbomachines.

5. Contrary to PCT Rule 5.1(a)(ii), the description

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

does not cite document D1 or indicate the relevant prior art disclosed therein.

6. Contrary to PCT Rule 5.1(a)(iii), the description is not in line with the claims.